REMARKS

Nonelected Claims 25-30, 63-65 and 91-95 have been cancelled.

Applicant acknowledges the allowance of Claims 31-35 and 66-85.

Claims 45-50, 55, 56 and 90 have been rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 45, 55 and 90 have been amended to delete reference to the words "fan" or "fanlike" therein. With these amendments and explanation, it is assumed that the rejection under 35 U.S.C. §112, second paragraph, will be withdrawn.

Claims 36-44 and 86-90 have been rejected under 35 U.S.C. §102(e) as being anticipated by Miller et al. (U.S. Patent No. 6,000,280). Claims 45-62 have been similarly rejected by Fan et al. (U.S. Patent No. 5,982,585). Reconsideration of these claims is respectfully requested.

Miller et al. disclose a comb-type actuator for movable microelectromechanical structures. In FIG. 1 thereof, cantilever moment arm portion 12 is mounted at a first, or near end 14 to the center of a laterally extending torsional support beam 16. In the illustrated embodiment, the opposite ends of the beam 16 are supported on, and preferably are integral with, a substrate 18 as at support mesas 19 and 20. The moment arm 12 is integral with beam 16 and in its preferred form is a grid of longitudinal and lateral beams, as illustrated in FIG. 1, the arm extending from a near end 14 generally horizontally forwardly from the support beam 16 to a far, or distal, end 21 along a longitudinal axis 22 (FIG. 2) which is perpendicular to beam 16. An upwardly-extending, or generally vertical, nanometer-scale sensing tip 23 is formed on the distal end 21 of the cantilever moment arm in the preferred form of the invention. Col. 7, lines 24-38. Counterweight 26 serves as an extension of cantilever moment arm 12 so that arm 12 and counterweight 26 rotate together about a lateral axis 27 (see FIG. 2) of the beam 16. Axis 27 lies in the x-y plane of arm 12 and beam 16, with axis 27 being perpendicular to the longitudinal axis 22 of arm 12. Rotation of arm 12 and weight 26 occurs upon application of vertical forces in the direction of arrow 28 in FIG. 1; that is, upon application of forces having a vector in the z direction to the tip 23. Col. 7, lines 50-58. Miller et al. further disclose that the planar configuration of the cantilever moment arms 12 and 120 illustrated therein may be subject to some in-plane twisting. In order to sense such twisting, a plurality of comb-type sensor sets 170, 172, 174, and 176 may be provided, as illustrated in FIG. 11. Movable finger electrodes 182 are mounted on the cantilever moment arm 12 for motion with the cantilever arm and extend between corresponding stationary electrodes 180 to form interleaved electrode fingers. The illustrated sensors detect motion, both within the plane of the cantilevers and out of the plane of the cantilevers. Further, upon application of suitable voltages; for example, through an active feedback circuit (not shown) on substrate 18, motion of the cantilevers can be damped or

enhanced to compensate for the twisting of the support beam 16. Col. 14, line 66 through Col. 15, line23.

Fan et al. disclose a rotary electrostatic microactuator. FIG. 13 thereof shows an embodiment of a microactuator 130 using a parallel branch design. Microactuator 130 includes a stationary structure 131a having branches 131 that are formed on a substrate (not shown) and a movable structure 132a having branches 132. The movable structure 132a is attached to the stationary structure 131a by a flexure member formed from a plurality of flexure elements 133 so that the movable structure moves about a center of rotation 134. Each of the stationary structure branches 131 are parallel to an adjacent stationary structure branch 131. Similarly, each of the movable structure branches 132 are parallel to an adjacent movable structure branch 132. Both branches 131 and 132 have electrode fingers that are attached at the proximal end of a finger at an angle that is substantially perpendicular to a straight line between the proximal end of the finger and the center of rotation 134 of microactuator 130. Flexure elements 133 forming the flexure member are a spring mechanism that connects the stationary part of microactuator 130 to the movable part. Preferably, flexure elements 133 are stiff in a translational direction of microactuator 130, while simultaneously being flexible in the rotational direction of microactuator 130. Further, it is preferable to use the shortest possible flexure element for further minimizing the area of a microactuator. To achieve the required rotational flexibility, it is optimum to place the branches as close as possible to the center of the rotation because the rotational spring constant is proportional to the square of the distance from the center of rotation to the position of the spring. Flexure elements 133 are each attached to an attachment surface 136 of an attachment structure 135. Attachment structure 135 is part of the stationary structure and has an area that includes the center of rotation 134 of the movable structure. Col. 7, lines 21-63.

Claim 36 is patentable by calling for an electrostatic microactuator of the type set forth therein having, among other things, a substantially planar substrate and a rotatable member overlying the substrate for rotation about an axis of rotation extending perpendicular to the substrate. In contrast, and as disclosed above, lateral axis 27 of the Miller et al. device extends in the x-y plane, that is parallel to the plane of substrate 18, not in the z axis extending perpendicular to the plane of substrate 18.

Claims 37-41 depend from Claim 36 and are patentable for the same reasons as Claim 36 and by reason of the additional limitations called for therein. For example, Claim 37 is additionally patentable by providing that the at least one electrostatic drive assembly is disposed between the first and second spaced-apart springs. Comb-type sensor sets 170, 172, 174 and 176 of the Miller et al. device shown in FIG. 11 are not disposed between the laterally extending torsional support beam 16 of the Miller et al. device.

Claim 40 is additionally patentable by providing that the first and second springs each extend radially from the axis of rotation. In contrast, support beam 16 disclosed in Miller et al. extends along the axis of rotation 27. Contrary to the statement of the Examiner, the "portions connecting 16 and 12", that is connector beams 76, 77, 78 and 79, are not springs as called for in Claim 36. Rather, the connector beams are provided with "vertical rigidity" in the direction of movement, that is rotation, of counterweight 26 about lateral axis 27. See Col. 10, line 63 through Col. 11, line 5.

Claim 42 is patentable for reasons similar to Claim 36 by calling for a micromechanical device of the type set forth therein having, among other things, a substantially planar substrate and a rotatable member overlying the substrate for rotation about an axis of rotation extending perpendicular to the substrate. As discussed above, lateral axis 27 of the Miller et al. device does not extend perpendicular to substrate 18 thereof.

Claims 43-44 depend from Claim 42 and are patentable for the same reasons as Claim 42 and by reason of the additional limitations called for therein. In this regard, Claims 43 and 44 are additionally patentable for the same reasons discussed above with respect to Claims 40 and 37.

Claim 86 is patentable by calling for a micromechanical device of the type set forth therein having, among other things, not more that first and second flexure members extending substantially radially of the axis of rotation. As discussed above with respect to Claim 40, support beam 16 disclosed in Miller et al. extends along axis of rotation 27, not radially of the axis 27.

Claims 87-90 depend from Claim 86 and are patentable for the same reasons as Claim 86 and by reason of the additional limitations called for therein. For example, Claim 90 is additionally patentable by providing that the movable structure has the shape of a sector of a circle when viewed in plan. Such a shape is not disclosed in Miller et al.

Claim 45 is patentable by calling for an electrostatic microactuator of the type set forth therein providing that, among other things, the rotatable member, the plurality of electrostatic drive assemblies and the first and second springs when viewed together in plan have the shape of a sector of a circle. Microactuator 130 disclosed in FIG. 13 does not have the shape of a sector of a circle. Instead, microactuator 130 is rectangular in shape.

Claims 46-50 depend from Claim 45 and are patentable for the same reasons as Claim 45 and by reason of the additional limitations called for therein. For example, Claim 46 additionally states that the rotatable member, the plurality of electrostatic drive assemblies and the first and second springs subtend an angle of approximately 180° or less about the axis of rotation, and Claim 47 additionally states that the rotatable member, the plurality of electrostatic drive

assemblies and the first and second springs subtend an angle of approximately 90° about the axis of rotation, neither of which limitations is disclosed in Fan et al.

Claim 51 is patentable by calling for an electrostatic microactuator of the type set forth therein having, among other things, a plurality of comb drive assemblies extending substantially radially from the axis of rotation and each having the shape of a truncated sector of a circle, each of the first and second comb drive members being provided with comb drive fingers, the comb drive fingers of the second comb drive member having respective distal ends which extend along an imaginary line that does not intersect the axis of rotation.

As discussed above, branches 131 and 132 of microactuator 130 do not extend radially from the axis of rotation, that is center of rotation 134, and have the shape of a truncated sector of a circle. Rather, Fan et al. disclose that each of the stationary structure branches 131 of microactuator 130 are parallel to an adjacent stationary structure branch 131 and each of the movable structure branches 132 are parallel to an adjacent movable structure branch 132.

Claims 52-56 depend from Claim 51 and are patentable for the same reasons as Claim 51 and by reason of the additional limitations called for therein. For example, Claim 55 additionally states that the rotatable member, the plurality of comb drive assemblies and the first and second springs when viewed together in plan have the shape of a sector of a circle and Claim 56 additionally states that the rotatable member, the plurality of comb drive assemblies and the first and second springs when viewed together in plan subtend an angle of approximately 180° or less about the axis of rotation, neither of which limitations is disclosed in Fan et al.

Claim 57 is a patentable by calling for an electrostatic microactuator of the type set forth therein having, among other things, first and second linear micromotors for imparting substantially linear motion and a first coupler for securing the first linear micromotor to the rotatable member and a second coupler for securing the second micromotor to the rotatable member so as to utilize the substantially linear motion of the first and second micromotors for rotating the rotatable member about the axis of rotation.

Contrary to the statements of the Examiner, Fan et al. do not disclose in microactuator 130 first and second linear micromotors for imparting substantially linear motion, let alone first and second couplers for utilizing the substantially linear motion to rotate the rotatable member about the axis of rotation. Rather, as stated above and noted in Fan et al. in Col. 7 commencing at line 27, the movable structure 132a of microactuator 130 is attached to the stationary structure 121a by a flexure member formed from a plurality of flexure elements 133 so that the movable structure moves about a center of rotation 134. Hence, the movable structure 132 does not impart "substantially linear motion" as called for in Claim 57 but instead imparts rotary motion about center of rotation 134. Flexure elements 133 do not rotate center of rotation 134, but instead couple the rotating movable structures 132 to the stationary center of rotation 134.

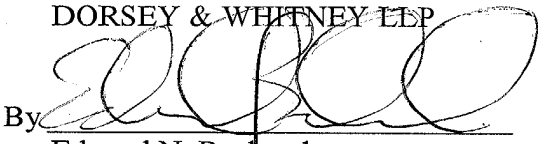
Claims 58-62 are patentable for the same reasons as Claim 57 and by reason of the additional limitations called for therein. For example, Claim 58 provides that the axis of rotation extends through the rotatable member. In contrast, the axis of rotation of microactuator 130 extends through the stationary center of rotation 134. Claim 62 additionally provides that the direction of travel of the first micromotor is parallel to the direction of travel of the second micromotor.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "Version with Markings to Show Changes Made."

In view of the foregoing, it is respectfully submitted that the claims of record are allowable and that the application should be passed to issue. Should the Examiner believe that the application is not in a condition for allowance and that a telephone interview would help further prosecution of this case, the Examiner is requested to contact the undersigned attorney at the phone number below.

Respectfully submitted,

DORSEY & WHITNEY LLP

By 

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